

## Program

### September 29 (Sun)

18:00-20:00 Reception

20:00-20:30 Network Information on Conferences Relevant to "Clusters"

Symposium on Size Selected Clusters (S3C) in Davos, Switzerland (February, 2020)

Symposium on Cluster Surface Interaction (CSI2020) in Genoa, Italy

20<sup>th</sup> International Symposium on Small Particles and Inorganic Clusters (ISSPIC-20)

in San Antonio TEXAS, USA (October, 2020)

Gordon Research Conference 2021

Gordon Research Seminar for young researchers 2021

Pacificchem 2020 in Hawaii, USA (December, 2020)

20:30-21:00 Poster Short Talk Advertisements for P1 – P18

### September 30 (Mon)

#### 8:30-9:00 Welcome Session

8:30-8:40 Introduction of the Fujihara Foundation of Science

8:40-8:45 Welcome Remarks

Hironori Iwase (The Fujihara Foundation of Science, Japan)

8:45-8:50 Welcome Remarks

Atsushi Koma (The Review Board Member of the Fujihara Foundation of Science, Japan)

8:50-9:00 Opening Remarks

Atsushi Nakajima (Keio University, Japan)

#### 9:00-12:30 Session I Novel Properties of Nanoscale Materials      Chair: Akira Terasaki

9:00-9:45 PL1 Uzi Landman (Georgia Institute of Technology, USA)

Small Is Different: Atomically Precise Nano Structures and Emergent Paradigms

9:45-10:20 KN1 Kimihisa Yamamoto (Tokyo Institute of Technology, Japan)

Synthesis of Multi-metallic Clusters Using a Dendrimer Reactor

10:20-10:55 Photo + Coffee

Chair: Gerd Ganteför

10:55-11:30 KN2 Gereon Niedner-Schatteburg (Technische Universität Kaiserslautern, Germany)

Solved and Unsolved Cases of Transition Metal Cluster Surface Morphologies and Activities

11:30-12:05 KN3 Shenggui He (Institute of Chemistry, Chinese Academy of Sciences, China)

Reactivity of Nano-sized Transition Metal Oxide Clusters

12:05-12:25 IVY1 Masahiro Shibuta (Philipps-Universität Marburg & Keio University, Japan)

Characterization and Optimization of Cluster-Surface Interaction: Metal-encapsulating Si<sub>16</sub>

Nanocluster Superatoms on Organic Substrates

12:25-14:00 Lunch

**14:00-18:05 Session II Novel Functionality of Nanocluster Materials**

**Chair: Peter Lievens**

14:00-14:35 KN4 Scott Anderson (the University of Utah, USA)

Size-Selected Catalysts and Electrocatalysts

14:35-15:10 KN5 John McGrady (University of Oxford, UK)

Endohedral Clusters of the Group IV Elements: A Coordination Chemist's Perspective

15:10-15:40 IV1 Mitsutaka Okumura (Osaka University, Japan)

Theoretical Investigation for the Hetero-Junction Effect Between Metal Clusters and Supports

15:40-16:10 Coffee

**Chair: Julia Laskin**

16:10-16:45 KN6 Hannu Häkkinen (University of Jyväskylä, Finland)

Monodispersed Ligated Gold Clusters in Aqueous Phase: Fundamentals and Potential Applications

16:45-17:15 IV2 Yuichi Negishi (Tokyo University of Science, Japan)

Alloy Clusters: Precise Synthesis and Mixing Effects

17:15-17:35 IVY2 Shinjiro Takano (the University of Tokyo, Japan)

Hydride-Doped Gold Clusters: Syntheses, Structures, and Transformations

17:35-18:05 IV3 Katsuaki Konishi (Hokkaido University, Japan)

Coordinated Subnano Gold Clusters: From Molecules to Assemblies

18:05-19:30 Dinner

19:30-21:30 Poster Presentations

19:30-20:00 All numbers, 20:00-20:45 odd numbers, 20:45-21:30 even numbers

**October 1 (Tue)**

**8:30-12:10 Session III Advanced Characterizations of Functional Nanoclusters**

**Chair: Yuichi Negishi**

8:30-9:15 PL2 Ulrich Heiz (Technical University of Munich, Germany)

Clusters for Energy Applications and in Asymmetric Catalysis

9:15-9:50 KN7 Julia Laskin (Purdue University, USA)

Gaseous Cluster Ions as Building Blocks for Multilayer Functional Materials

9:50-10:10 IVY3 Tetsuichiro Hayakawa (Genesis Research Institute Inc., Japan)

Oxidation-State Measurement by X-ray Absorption Spectroscopy on Size-Selected Clusters of Cerium Oxide and its Derivatives

10:10-10:40 Coffee

**Chair: Gereon Niedner-Schatteburg**

10:40-11:15 KN8 Peter Lievens (KU Leuven, Belgium)

Decay and Optical Properties of Small Noble Metal Clusters

11:15-11:50 KN9 Tatsuya Tsukuda (the University of Tokyo, Japan)  
Chemically Modified Gold and Silver Superatoms: From Liquid Phase to Gas Phase  
11:50-12:10 IVY4 Tetsuya Kambe (Tokyo Institute of Technology, Japan)  
Synthesis of  $Al_{13}^-$  Superatom Through Typical Metal Assembly in a Dendrimer Template

12:10 Lunch

12:50 Excursion (Factory of Oji Paper Co., Ltd. in Tomakomai, the Shikotsu Lake)

18:00 Banquet (KIRIN Beer factory HAUBE)

## **October 2 (Wed)**

### **8:30-12:15 Session IV Fundamentals and Applications of Functional Nanoclusters**

**Chair: Mitsutaka Okumura**

8:30-9:05 KN10 Gerd Ganteför (Universität Konstanz, Germany)  
Long-lived Excited States in Metal Clusters  
9:05-9:35 IV4 Akira Terasaki (Kyushu University, Japan)  
Evolution of Optical Responses of Free Silver Clusters as a Function of Size  
9:35-9:55 IVY5 Toshiaki Nagata (Tohoku University, Japan)  
Geometrical Structures of Ceria-Based Composite Clusters Studied by Ion Mobility Mass Spectrometry

9:55-10:20 Coffee

**Chair: Scott Anderson**

10:20-10:55 KN11 Fengqi Song (Nanjing University, China)  
Low Temperature Transport of Atomic Clusters and Cluster-Decorated System  
10:55-11:30 KN12 Panagiotis Grammatikopoulos (Okinawa Institute of Science and Technology, Japan)  
Nanoparticles Design by Gas Phase Synthesis  
11:30-11:50 IVY6 Chloé Minnai (Okinawa Institute of Science and Technology, Japan)  
Optical and Electrical Properties of Nanostructured Material Fabricated with Supersonic Cluster Beams  
11:50-12:10 IVY7 Tsugunosuke Masubuchi (Dalian Institute of Chemical Physics, Chinese Academy of Sciences, China)  
Thermal Activation of Methane by Cationic Tantalum Clusters and Their Oxides  
12:10-12:15 Closing Remarks  
Atsushi Nakajima (Keio University, Japan)

After Lunch Departure

## Poster Session in the evening on September 30

### P1 Vibrational Spectra of Thiolate Protected Gold Nanoclusters with Infrared Reflection Absorption Spectroscopy

Takaho Yokoyama,<sup>1</sup> Naoyuki Hirata,<sup>1</sup> Hironori Tsunoyama,<sup>1</sup> Toyoaki Eguchi,<sup>2</sup> Yuichi Negishi,<sup>3</sup> Atsushi Nakajima<sup>1,4</sup>; <sup>1</sup>Keio University, <sup>2</sup>Tohoku University, <sup>3</sup>Tokyo University of Science, <sup>4</sup>Keio Institute Pure and Applied Science

### P2 Fluorine Modification of Hollow-Type Polyoxometalate {Mo<sub>132</sub>}

Chinatsu Murata,<sup>1</sup> Yukatsu Shichibu,<sup>1,2</sup> Katsuaki Konishi<sup>1,2</sup>; <sup>1</sup>Environmental Science, Hokkaido University, <sup>2</sup>Environmental Earth Science, Hokkaido University

### P3 Fabrication and Characterization of M@Si<sub>16</sub> Hetero Layer Film

Toshiki Niikura,<sup>1</sup> Masahiro Shibuta,<sup>1,2,3</sup> Hironori Tsunoyama,<sup>1</sup> Atsushi Nakajima<sup>1,2</sup>; <sup>1</sup>Keio University, <sup>2</sup>Keio Institute of Pure and Applied Science, <sup>3</sup>Philipps-Universität

### P4 Synthesis and Characterization of Dithiolate-Ligated Au Clusters

Yuki Saito,<sup>1</sup> Yukatsu Shichibu,<sup>1,2</sup> Katsuaki Konishi<sup>1,2</sup>; <sup>1</sup>Environmental Science, Hokkaido University, <sup>2</sup>Environmental Earth Science, Hokkaido University

### P5 Enantioselective Oxidation Catalysis of Colloidal Sub-2nm Au Clusters Modified with Cyclodextrin Derivatives

Koto Hirano,<sup>1</sup> Shinjiro Takano,<sup>1</sup> Tatsuya Tsukuda<sup>1,2</sup>; <sup>1</sup>The University of Tokyo, <sup>2</sup>Kyoto University

### P6 Graphene Oxide Film Isolated Raman Spectroscopy for Subnano Particles Analysis and Application

Yuansen Tang,<sup>1</sup> Akiyoshi. Kuzume,<sup>2</sup> Kimihisa. Yamamoto<sup>1,2</sup>; <sup>1</sup>Tokyo Institute of Technology, <sup>2</sup>JST-ERATO

### P7 Negative Binding Energy of Electrons in X@Ag<sub>12</sub> Superatomic Core of [XAg<sub>28</sub>(1,3-benzenedithiolate)<sub>12</sub>]<sup>3-</sup> (X = Ag, Au) as Revealed by Photoelectron Spectroscopy

Katsunosuke Nakamura,<sup>1</sup> Keisuke Hirata,<sup>1</sup> Kuenhee Kim,<sup>1</sup> Kiichirou Koyasu,<sup>1,2</sup> Tatsuya Tsukuda<sup>1,2</sup>; <sup>1</sup>The University of Tokyo, <sup>2</sup>Kyoto University

### P8 Multinuclear Platinum-Thiolate Complexes for Size-Selective Synthesis of Platinum Clusters

Yuki Akanuma,<sup>1</sup> Takane Imaoka,<sup>1,2</sup> Kimihisa. Yamamoto<sup>1,2</sup>; <sup>1</sup>Tokyo Institute of Technology, <sup>2</sup>JST-ERATO

### P9 Thiolate (RS)-protected Au<sub>25</sub>(SR)<sub>18</sub> Clusters with Novel Structures and Redox Properties

Tsubasa Omoda,<sup>1</sup> Shinjiro Takano,<sup>1</sup> Tatsuya Tsukuda<sup>1,2</sup>; <sup>1</sup>The University of Tokyo, <sup>2</sup>Kyoto University

### P10 Subnano Copper Oxide Particles for Efficient Hydrocarbon Oxidation Reactions

Kazutaka Sonobe,<sup>1</sup> Makoto Tanabe,<sup>2</sup> Kimihisa. Yamamoto<sup>1,2</sup>; <sup>1</sup>Tokyo Institute of Technology, <sup>2</sup>JST-ERATO

### P11 Size-Dependent Reactivity and Inertness in O<sub>2</sub> Adsorption on Silver and Copper Nanocluster Cations

Masayuki Kadoguchi,<sup>1</sup> Ryosuke Ito,<sup>1</sup> Hiroaki Yamamoto,<sup>2</sup> Masahide Tona,<sup>2</sup> Keizo Tsukamoto,<sup>2</sup> Keijiro Ohshimo,<sup>1</sup> Fuminori Misaizu<sup>1</sup>; <sup>1</sup>Tohoku University, <sup>2</sup>Ayabo Corporation

### P12 Theoretical Study of Correlations Between Structures and Catalytic Activities in Polymer-Stabilized Au Nano Cluster Catalysts

Yoshinori Ato, Akihide Hayashi, Takashi Kawakami, Shusuke Yamanaka, Mitsutaka Okumura; Osaka University

**P13 The Origin of Composition of Group 5 Metal Nitrides as Revealed by Successive Nitridation of Tantalum Cluster Cations by NH<sub>3</sub> Molecules**

Masashi Arakawa,<sup>1</sup> G. Naresh Patwari,<sup>2</sup> Akira Terasaki<sup>1</sup>; <sup>1</sup>*Kyushu University*, <sup>2</sup>*Indian Institute of Technology Bombay*

**P14 Tracking of Ligand-Exchange Reaction of Thiolate-Protected Gold Cluster and Elucidation of Size-Conversion Mechanism Using LC/MS**

Ayano Ebina,<sup>1</sup> Sayaka Hashimoto,<sup>1</sup> Tokuhisa Kawawaki,<sup>1</sup> Yuichi Negishi<sup>1</sup>; <sup>1</sup>*Tokyo University of Science*

**P15 Cluster Growth in the Magnetron-Sputtering Cluster Source Studied by Optical Emission Spectroscopy**

Satoshi Kono, Masashi Arakawa, Akira Terasaki; *Kyushu University*

**P16 Behavior of Thiolate-Protected Gold Silver Alloy Cluster in Solution**

Sayaka Hashimoto, Yoshiki Niihori, Tokuhisa Kawawaki, Yuichi Negishi; *Tokyo University of Science*

**P17 Exploring Electronic and Geometric Structures of Both Cationic and Anionic Transition-Metal-Doped Silver Clusters via Reaction with Dioxygen**

Kento Minamikawa, Naho Hayashi, Masashi Arakawa, Akira Terasaki; *Kyushu University*

**P18 Effect of Mono-Heteroatom Doping of Cocatalyst Loaded on Water-Splitting Photocatalyst**

Yuki Kataoka,<sup>1</sup> Kosuke Wakamatu,<sup>1</sup> Wataru Kurashige,<sup>1</sup> Seiji Yamazoe,<sup>2</sup> Akihide Iwase,<sup>1</sup> Akihiko Kudo,<sup>1</sup> Yuichi Negishi<sup>1</sup>; <sup>1</sup>*Tokyo University of Science*, <sup>2</sup>*Tokyo Metropolitan University*